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Adapting the QFD Approach to Extended Service Transactions

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Abstract
This paper proposes an adaptation of quality function deployment (Qfd) for services, more specifically extended service transactions. We propose two modifications to service applications of Qfd. One is the inclusion of higher-level customer needs (consequences, benefits, experiences, and personal values) to incorporate the experiential and personal nature of extended service transactions into the process. The second modification is to use customers' knowledge and expertise regarding service production and delivery as input beyond the house of quality. An interviewing method is proposed for a comprehensive assessment of customer needs at multiple levels. Results from an empirical application of this technique to luxury business hotels support the proposed modifications to Qfd to increase its potential for application to services.

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service design, customer information, quality function deployment, extended service transactions

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Introduction

The processes of quality assurance and product design present unique challenges when applied to services, particularly those *extended service transactions* (Deighton, 1994; Dube and Morgan 1996; Arnould and Price 1993). Examples of extended service transactions include airlines, resort hotels, leisure activities, education and healthcare services, as well as a diversity of professional services. In these industries, a single "product" is made up of physical goods and services embedded within a series of discrete consumption experiences. These experiences unfold over time, according to scripts, in which providers and customers interact or coproduce the service within a physical environment designed by a firm.

This paper proposes and explored important modifications to quality function deployment (QFD), a popular quality assurance and design methodology, to increase its usefulness in service application and specifically extended service transactions. To illustrate the unique nature of extended service transactions, consider the "product" being described and promoted in the copy of the following Ritz Carlton print advertisement:

Sometimes, it's possible to gain the upper hand even before you start doing business. A stately limousine awaits your arrival in Singapore. Jet lag and traffic recede swiftly as you are whisked away to an unforgettable oasis in the heart of the city. Here, rooms 25% larger than other 5-star hotels liberate the individual. Lavish views uplift the senses, even from the bathroom windows. Breathtaking interiors provide ample inspiration for your next business move. As you soak in the luxury, the legendary service and attention to detail, a realization dawns. You are now more relaxed, collected and focused than your corporate adversaries.

The advertisement is more than hype. It defines not only the physical products and services the management intends to offer, but also the links to higher-order customer benefits and personal values (such as relaxation, hedonism, achievement, and power). In extended service transactions, the firm is responsible for designing, producing and managing the entire purchase and consumption experience according to the set of promises. When developed for a 600-room luxury hotel, for example,

positioning on such experiential benefits and the achievement of higher-order values sets a difficult agenda for those involved in operations planning and control. This difficulty is compounded by the presence within the hotel at the same time of different market segments with often diverse and even contradictory needs, whose translation into a promised experience imposes additional operational challenges.

We propose two particular modifications to QFD to increase its applicability to services. The first is aimed at creating systematic links between customers' higher-order consequences, benefits, experiences, and personal values and the lower-order attributes that serve as input to the house of quality. The second modification is aimed at using customer input beyond the house of quality while simultaneously preserving the systematic, chain-like translation process offered by QFD. In Section 2 we describe QFD and its existing adaptation to a service context in more detail. In Section 3 we present the rationale for each of the proposed modifications for extended service transactions. In Section 4 we propose an interviewing technique that combines features of QFD with a laddering method used primarily in advertising and marketing research (Herrmann 1996; Reynolds and Guttman 1988) to provide the comprehensive customer information required by the proposed QFD modifications. In Section 5 we apply this technique in the context of luxury business hotels and analyze the data to validate the bases for our proposed modifications. Section 6 summarizes the study and findings and discusses the managerial implications of this new approach to QFD.

QFD and Service QFD

The Relevance of QFD to Services

The services marketing literature (e.g., Edvardsson 1997; Rust and Oliver 1994) suggests that effectively managing service quality involves three distinct tasks. First is the designing of the service product and its desired customer outcomes. Second is the designing of the service environment in terms of the physical settings and props required for each transaction to unfold. Third is the development of a system for

delivering the service at a time and place determined by the customer. In extended service transactions, these three tasks are intricately linked: The best product and environment design in the world will not work if it is not implemented properly by the people, the systems, and the processes that are actually delivering the service. Thus, successful service design and development requires a systematic approach that create a well-articulated interface between a comprehensive set of customer needs, their translation into various service attributes, and the upfront consideration of the firm's ability to deliver these attributes as part of the service design process proper. In current practice, delivery systems are considered primarily after the design phase in customer satisfaction systems (Rust, Zahorik, and Keiningham 1995) as part of quality management.

One of the few systematic tools potentially useful for making the above links is quality function deployment or QFD (Akao 1990; Mizuno and Akao 1994; Hauser and Clausing 1988). QFD essentially translates the "voice of the customer" into its means of accomplishment within an organization. In a physical product context, QFD establishes effective interfaces from customer needs through engineering or design characteristics, parts characteristics, key process operations, and production requirements. Broad-based applications of QFD in a physical product context have, for example, been shown to reduce design costs and development time, solidify design decisions early in the development cycle, and improve communication and cohesion within product development teams (Griffin and Hauser 1992; Gustafsson and Ekdahl 1997).

However, in spite of adaptations of the original method to services (Mazur 1997; Stauss 1993), service applications of QFD remain limited. Although there are over a thousand documented case studies on QFD in Japan alone (Akao 1997), Mazur (1997) reports only 136 documented applications worldwide for services. Moreover, of these 136 applications, the frequency of reports by year peaked in 1993 and has remained stable, if not declined, since. We argue that it is a lack of understanding of the breadth and complexity of the customer needs that had to be integrated into product design, environment design, and delivery systems that has limited the successful implementation of QFD in industries with extended service transaction, whether for incrementally improving upon or completely redesigning services.

Product QFD

Quality function deployment or QFD is a method conceived in Japan in the late 1960s under the umbrella of total quality control to provide a map for interfunctional planning and communications (Akao 1997). As Akao (1990) describes, QFD is “a method for developing a design quality aimed at satisfying the consumer and then translating the consumer’s demands into design targets and major quality assurance points to be used throughout the production stage.” In the traditional approach to QFD (Hauser and Clausing 1988), the product team starts with an input list of desired customer needs in the form of product attributes or characteristics. These needs are ordered hierarchically from primary, to secondary, to tertiary using, for example, affinity diagrams.

It is at this level of tertiary product attributes that the translation process typically begins in the first house of QFD or “house of quality.” Importance weights and comparative perceptions with competitive offerings are generally collected for these needs (such as the ease with which a car door opens or closes from the outside). The house of quality translates the product attributes into desired design or engineering characteristics. These should be measurable characteristics of the product that directly affect customer perceptions (such as the force required to open or close a car door from the outside). In QFD terms, they are the measurable means (the Hows) by which a product will be able to deliver on customer needs (the Whats).

Engineering characteristics play a central role in traditional QFD since they are the unique, objective expressions of customer needs (i.e., quality requirements), which will be carried through in a chain-like system and built upon in the design and manufacturing sequence to assure quality (Akao 1990). The relationship matrix in the house of quality relates the customer needs to the engineering or design characteristics. This matrix is analyzed to first identify customers needs most in need of improvement (those where relative importance is high and relative performance is low). Engineering characteristics are then targeted for improvement based on their relationship to the

customer needs (i.e., the Hows that will deliver on the Whats of customer needs). The roof of the house of quality is essentially a correlation matrix that identifies tradeoffs among the engineering characteristics. In subsequent houses, targeted engineer characteristics are translated into “part characteristics,” “key process operations.” and “production requirements.” The targeted Hows of one house become the Whats of the next house so that the sequential and systematic relationships across the four linked houses explicitly convey customer needs through design and manufacturing (Hauser and Clausing 1988; King 1989).

A more comprehensive approach to QFD, developed by Akao (1990), complements the traditional QFD houses with separate matrix systems to incorporate technology, cost, and reliability deployment. These matrix systems are used throughout the planning, design, testing, manufacturing, and service phases of product development. Within both the traditional and more comprehensive approaches to QFD, once the house of quality is completed, the process turns internally to design and operations management (parts, processes, and production requirements). That is, customer input is only used as input to the first house. Akao (1990, p. 10) argues forcefully that it is a mistake to consider input from the customer when developing engineering characteristics when he states, “the conversion from the left to the top is really a conversion from the world of the consumer to the world of the engineer." Indeed, this view is appropriate for physical goods that are manufactured under quality control, packaged, put on the store shelf, and after purchase, used and consumed in contexts distinct from both its production and its purchase. However, this is not the case for most services where the customer is directly involved in “downstream" QFD activities such as service delivery.

Sendee Adaptations of QFD

Because many services are intangible and interpersonal in nature and are coproduced with the customer at the time of consumption, they are fundamentally different from physical products. Nevertheless, as argued previously, service quality and

design has much to gain from the structure and inside-outside links of QFD and early applications of the method to services appear promising. For example, Ohfuji, Noda and Ogino (1990) describe several early applications of traditional QFD quality charts to the physical planning and design of retail stores and malls, with specific features linked to customer needs.

The most complete adaptation of QFD to services, labeled comprehensive service QFD (Mazur 1993, 1997, 1998), is patterned after Akao's (1990) comprehensive QFD described earlier. Central to the approach is the substitution of the quality-parts-process-production links in traditional QFD with quality-function-process-task links for a service. A more complete characterization of comprehensive service QFD is illustrated in Figure 1. According to Lampa and Mazur (1996), this system is specifically aimed at maximizing customer satisfaction by seeking out customer needs, translating these into actions and designs, and communicating these throughout the organization.

It is interesting that comprehensive service QFD contains two deployment matrices that relate to strategic considerations, prior to the house of quality. In Customer Deployment, priorities are first established in terms of organizational goals (such as profits and customer satisfaction) and related to existing and required organizational skills and resources, or core competencies (such as locations, architecture, and human resources). In Voice of the Customer Deployment, the core competencies are related to customer segments in an attempt to pinpoint those segments for which the core competencies will represent value. Once a segment or set of segments is selected, a detailed analysis is conducted of the segment's needs, or demanded service quality, for input to Quality Deployment (i.e., the house of quality). The house of quality matrix translates the demanded service quality of the segments into tangible or intangible service quality attributes (akin to engineering characteristics). Similar to traditional product-based applications of QFD, these service attributes must have measurable levels of performance but cannot relate specifically to technologies, processes, procedures, or tasks. Examples would include the turnaround time for room cleaning or laundry services in a hotel. Customer importance and performance benchmarks serve to target service quality attributes in need of improvement.

Targeted service quality attributes are used as input to two deployment matrices. In Reliability Deployment, done primarily on the basis of fault tree analysis, failure points in the service delivery are identified so as to preclude them from the service process. It is similar to service mapping, in which the chronology of a service is mapped out (as with a “fishbone" diagram) to identify failure points (Johnson 1998). To continue the translation, the service quality attributes are used as input to Function Deployment, in which each attribute is translated into a corresponding set of activities or functions that have to be performed. Targeted functions are then used as input to Process Deployment (also called new concept deployment), in which both existing and potential new process designs are related to the desired functions or activities. Finally, in Task Deployment, job descriptions and operating procedures required to execute the service designs are formulated and detailed.

The comprehensive service QFD approach has thus far been applied primarily to less complex components of a service or some well-defined subset of service activities. For example, Lampa and Mazur (1996) used the approach to improve the process of an airport bagel kiosk, while Kirk and Galanty (1994) similarly improved the housekeeping component of a hotel stay. Although there are at least two other extensions of QFD to services, they are more limited in scope. What Stauss (1993) labels Senice Problem Deployment uses the frequency and severity of customer service problems as input to the first house of quality, which are subsequently translated into internal performance measures (functions), processes, and responsibilities (tasks). The second extension, called Blitz QFD (Mazur 1997) is a scaled down version of comprehensive QFD that identifies and deploys resources to improve only the most glaring customer needs.

Strengths and Weaknesses of Service QFD

Current service-based approaches to QFD offer important adaptations that address at least some of the unique characteristics of services industries. Foremost, these approaches translate traditional QFD into a language and process suitable for services by linking demanded service qualities to service functions, processes, and

tasks. This adaptation recognizes the coproduction inherent in a service, which makes it problematic to separate parts from processes as in traditional QFD. Rather, parts and processes are considered simultaneously within process deployment. Another important advantage of comprehensive service QFD in particular is the addition of the customer deployment phase. This effectively starts the whole process by strategically determining which customer segments best fit the core competencies of the service firm. Comprehensive service QFD also provides a detailed mapping of customer needs in different usage contexts (i.e., voice of customer deployment) in order to capture much of the interpersonal, process-like nature of services, including extended service transactions. By assessing how customers actively participate in the production of a service, the approach captures customer information regarding many of the tangible and intangible aspects of the core and peripheral services.

However, as described in our introduction, service applications of QFD remain quite limited. Although there are likely several reasons for the limited diffusion of QFD to services, we focus on two. In many services and particularly extended service transactions, demanded service qualities include the experience of sensory or social pleasure, aesthetic enjoyment, intellectual achievement, states of mind, and emotional responses. Our review of the literature reveals a very limited representation of these experiential qualities in the customer needs data of service QFD applications. These include the taste and visual appeal of baked goods (Lampa and Mazur 1996) and the in-store experience one feels at an IKEA store (Gustafsson and Johnson 1997).

It is understandable why the links from service quality attributes to experiential aspects of consumption and personal values have not been studied more extensively. These links are difficult to capture, as customers have a difficult time articulating them using traditional survey or interview methods. Fortunately, this problem has been addressed systematically in advertising research, where interviewing techniques are available that unravel the deeper psychological motives and link them directly to the product attributes that motivate purchase decisions. These techniques are described in the next section of the paper.

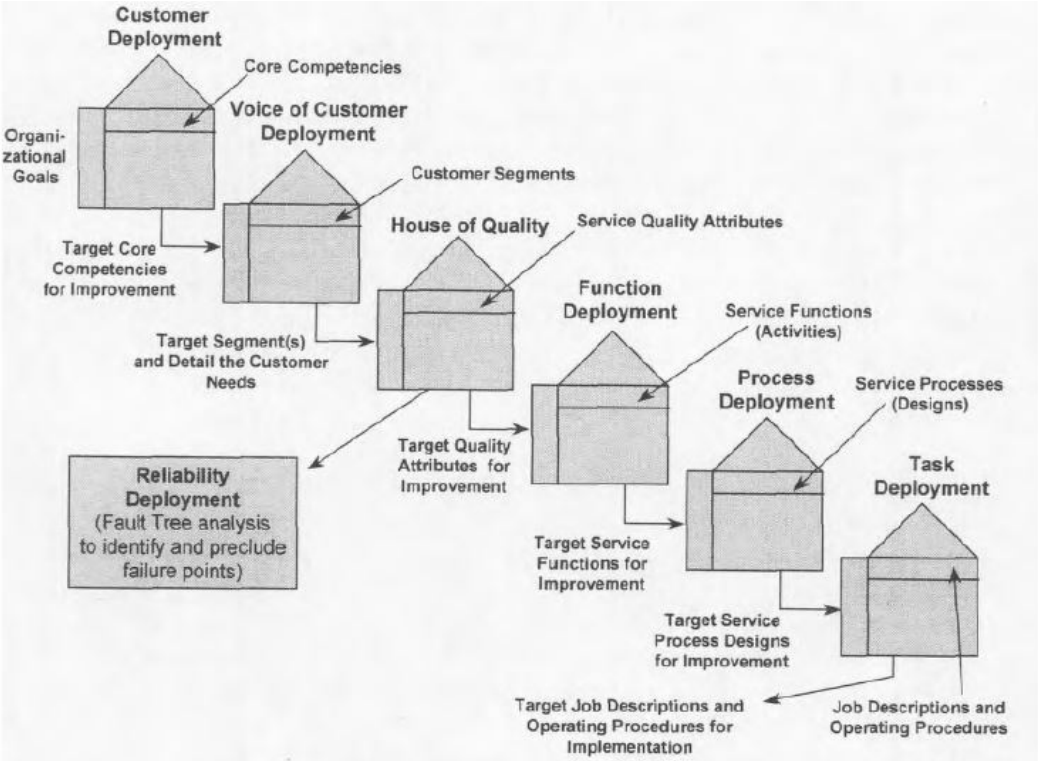

FIGURE 1. Comprehensive Service QFD (Adapted from Mazur 1993, 1997).

A second limitation is that service applications of QFD, following Akao's (1990) earlier arguments, only include customer input in terms of customer needs (demanded quality), which are translated into measurable service quality attributes in the house of quality. No input is considered beyond the house of quality. This excludes from consideration all customer inputs that relate to measurable service quality attributes, service functions, processes, designs, and/or implementation plans bearing on technology, procedures, or tasks (Mazur 1997). Currently, customer needs that bear directly on these operational dimensions do not qualify as "demanded quality items" and, therefore, are not used as input to the QFD translation process.

We argue and subsequently show that, because extended service transactions are produced in front of and in close collaboration with customers, customers develop needs bearing on aspects of a service that existing approaches to QFD would claim is the exclusive domain of the product or service "engineer." Customers are not passive observers. They play an active role in service production and delivery. To leverage all available information, customer input should be used beyond the house of quality. The

key will be to incorporate this information without sacrificing the primary benefit of the QFD translation process—that being the formation of tight links from higher level customer needs all the way down to their means of accomplishment within a service organization.

Moreover, from our review of published applications of comprehensive service QFD, it seems that in shifting the emphasis from physical products to service functions and processes, some of the systematic, chain-like considerations of customer needs related to physical quality have been lost. Consider the translation of customer needs related to the physical product component of an extended service transaction (e.g., seafront location for a resort hotel, sleeper seats in airline business class). The systematic translation of such needs into structural aspects of the service firm's facility may get lost when product and service attributes are only translated into service functions, processes, and tasks.

A Modified QFD Approach for Extended Service Transactions

We have argued that the shortcomings of previous service approaches to QFD are particularly pronounced for extended service transactions. Continued diffusion of QFD into service applications should depend, therefore, on overcoming these limitations. The proposed adaptation of QFD for extended service transactions is presented in Figure 2. Our approach builds upon the comprehensive service QFD, using the same terminology whenever appropriate.

Integrating Higher-Order Consumer Needs in the Voice of Customer Deployment

The first proposed modification is to explicitly measure and incorporate the links from concrete service attributes to customers' higher-level needs. At an intermediate level, these include attribute consequences, benefits, and experiential aspects of the

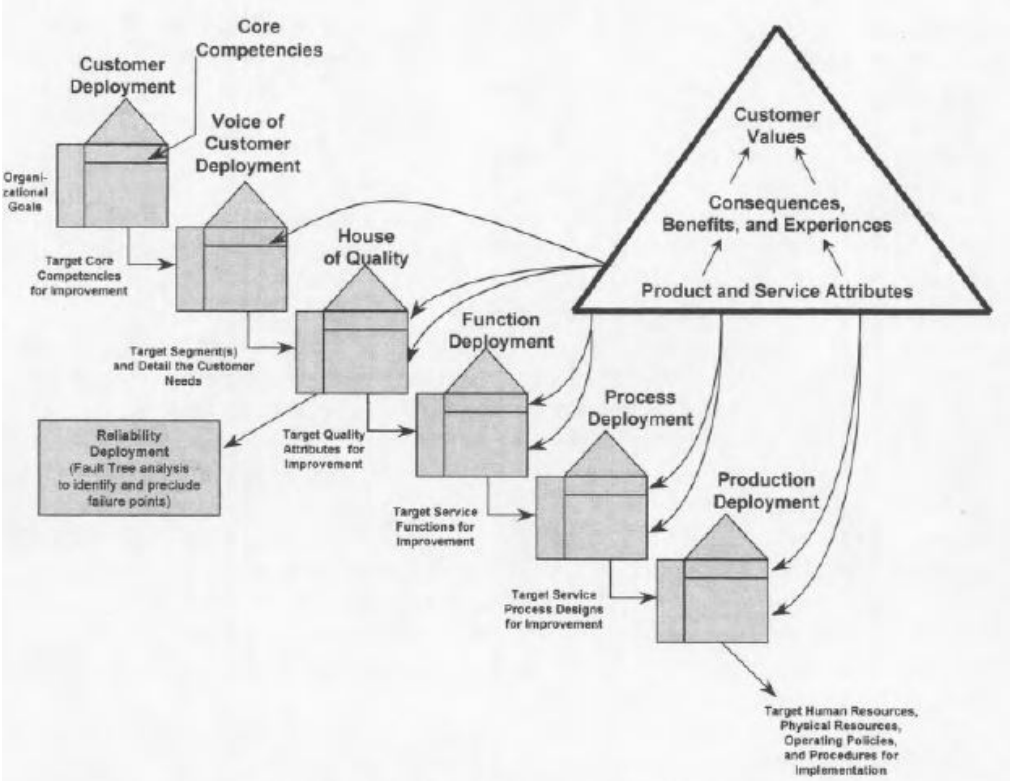

FIGURE 2. Adaptation of QFD for Extended Service Transactions.

consumption experience. Experiential aspects themselves encompass the more symbolic, emotive, aesthetic, and interpersonal sides of consumer behavior. At an even higher level, these include the personal values that the consequences, benefits, and experiential aspects ultimately fulfill (Howard 1977). Following Rokeach (1973), personal values are enduring beliefs that particular modes of conduct or end states of existence are preferred over other modes of conduct or end states. They include instrumental values, or values of doing (which are akin to the experiential aspects of an extended service transaction), and terminal values, or desired end states of existence (such as power, self-respect, or sense of accomplishment).

This proposition is based on the assumption that products (including extended service transactions) are means toward achieving higher-order goals (Guttman 1982; Hermann 1996). Accordingly, a customer purchases products with specific features in order to achieve benefits and have experiences that fulfill certain values. The existence of such higher-order needs and their links to product attributes has long been recognized and measured in advertising research by the technique termed means-end analysis (Reynolds and Guttman 1984, 1988). Precise attribute-consequence-value

chains reflecting customer needs are first spelled out for each market segment. The observed links are then used for a more precise engineering of the message elements and execution of the advertisement (Reynolds and Craddock 1988; Gengler and Reynolds 1995).

Similarly, we propose that in designing and delivering extended service transactions, these higher order values, which often define a firm’s positioning in the market, translate into product and service attributes that can be specified and “engineered” into the service design and delivery. As can be seen in Figure 2, we propose that this hierarchy of needs interface directly with the voice of the customer deployment phase of service QFD. Notice that the customer needs in Figure 2 are arranged as a pyramid. This captures the notion that for any given product or service, there are likely to be more concrete attributes than abstract consequences and benefits, and more consequences and benefits than values served (Johnson 1998). Through the process of abstraction, a single abstract need likely captures or summarizes a number of more concrete needs. For example, a wait staff performs multiple tasks (attributes) to provide courteous service (a benefit), while courteous service is just one factor that ultimately influences self-respect (a value). The pyramid is similar in this regard to other voice of the customer tools, such as affinity diagrams. Some recent attempts have been made to link internal process quality to higher-order customer data in product design. For instance, Herrmann, Huber and Gustafsson (1997) suggest, without explicitly testing the procedure, to detail attribute-consequence-value relationships using laddering interviews while linking the attributes to the traditional four phases of QFD.

The purpose of this comprehensive representation of customer needs is twofold. At the strategic level, a more explicit understanding of the links from product and service attributes to customers' personal values leverages the selection of target market segments. An up-front consideration of the firm's resources and abilities when targeting particular market segments is particularly important when designing an extended service transaction. In these industries, the resource capacity that a firm needs to meet its demands has to be determined long in advance (the equivalent of aggregate planning in manufacturing terms). Because of the coproduction involved, resource capacity also has to be estimated in terms of a firm's ability to simultaneously satisfy the

needs of all customer segments comprising its business mix, at a given point in time, even when running at full occupancy.

A more comprehensive representation is also central toward determining the relative importance of product and service attributes in the house of quality. How, for example, does one best determine whether the impact of guest room size equals or exceeds the impact of individualized attention at check-in? Research in both the marketing and quality areas (Gustafsson and Johnson 1997; Rust, Zahorik, and Keiningham 1995) demonstrates that it is problematic to begin obtaining customer importance information directly at the level of secondary or tertiary attributes (as is customary in applications of QFD).

Gustafsson and Johnson (1997) present an alternative approach to linking internal process quality to higher-order customer data through the integration of customer satisfaction models with QFD. The authors equate the primary attributes in voice of the customer analysis to customer benefits in a satisfaction model. Secondary and tertiary attributes are akin to the more concrete product and service attributes in a satisfaction model. Again, in contrast to traditional QFD applications where importance measures are obtained and the translation process begins at the level of tertiary attributes, they describe a statistical procedure for developing benefit and attribute weights simultaneously. By explicitly modeling the links from attributes, to benefits, to satisfaction and business performance measures (such as customer loyalty), the overall weight of individual attributes is more precisely determined. They illustrate the approach using a satisfaction model and partial QFD for an Ikea furniture store. Conceptually, this approach is consistent with Rust, Zahorik, and Keiningham's ROQ (return on quality; 1995) approach in customer satisfaction measurement, in which the weight of a particular concrete attribute is dependent on its upstream impacts on, for example, more general service qualities, overall satisfaction, and retention.

Using Voice of the Customer Information Beyond the House of Quality

The second proposed modification to QFD is the inclusion of voice of the customer input into the translation process beyond the house of quality. Before describing this modification, it is important to note that we use traditional QFD terminology when referring to production deployment in Figure 2. This way we encompass human resources, physical resources, and operating policies and procedures. The focus in comprehensive service QFD on task deployment (see Figure 1) is simply more limiting.

The second modification is captured in Figure 2 by the arrows from the voice of the customer pyramid (deployment) directly into both the Hows and relationship matrices of the various process and operations houses. The primary justification for including these links is that customer needs extend to those things they like to see in particular service designs, activities, tasks, human resources, and physical resources. Again, this is because customers in an extended service transaction are often intimately involved and highly experienced (such as “gold card" airline passengers or “executive class” hotel guests). In other words, service customers speak the engineer’s language. For instance, when a hotel customer wishes room service to be available 24 hours a day or laundry available in 3 hours, it translates directly into particular operating policies and service quality attributes, respectively.

Of course, it is critically important just how this information is used. Two considerations are paramount. As argued, a primary benefit of QFD is the tight, chain-like links that are formed from customers to internal operations. Using customer input throughout the whole design process could circumvent this main purpose of QFD. The second is that the customer may only be familiar with particular operational procedures that they like and are unable to envision potentially superior alternatives that emerge from the QFD design process.

We suggest two primary ways in which this customer data can be leveraged without sacrificing the benefits of the QFD process. The first is to use customer input regarding service qualities, functions, parts, processes, and tasks to supplement the development of the *Hows* in the various deployment houses (hence the arrow from the voice of the customer pyramid to the *Hows*). Rather than relying only on the cross-functional team to brainstorm the *Hows* that impact the *Whats*, the customers’ own

knowledge of the *Hows* should serve as input to the process. This is similar to using the customers as “lead customers or users” in a product development process (Von Hippel 1988). An alternative approach would be to use the customers' *Hows* as a holdout sample and compare it to those developed by the service team to determine whether a deployment matrix is comprehensive. For example, if the team fails to incorporate many of the *Hows* elicited by customers, it would be an indication that the brainstorming process was either incomplete or requires direct customer input. Importantly, the targeting of particular *Hows* should still be based on the relative importance and performance on the *Whats* within a particular deployment matrix, not what the customer necessarily identifies as most important. Recall that customers may not be familiar with alternative approaches to fulfilling a particular *What* that dominates what they are currently familiar with or prefer. In this way, the priority setting and transformation logic of QFD are preserved.

The second use of customer data would come in determining the relationships between the *Whats* and the *Hows* in the various deployment matrices. Service customers do not just have knowledge of the elements of service activities, designs, and procedures. They also have some understanding of how these different levels in the deployment process relate to one another. By drawing on the customers’ expertise, the service team is in a better position to gauge the strength of relationships when targeting tasks or operating procedures for improvement. Again, as long as the service team uses the relative importance of and performance on the *Whats* in any given house to target *Hows* for improvement, this use of customer data should not compromise the QFD process. Rather, by tapping into a greater storehouse of knowledge in the customer population, it should leverage the process.

Regardless of the ways in which customer input is used beyond the house of quality, it appears critical to systematically consider discrepancies between the customer’s and the engineer’s perspectives. If the different perspectives cannot be aligned because customer needs are not optimal from an operational standpoint, ignoring them does not make them go away. Customers often live in the “service factory” for an extended period of time. If service design can choose to ignore this noise made by the “customer-ghost-in-the factory,” service delivery may not. The upfront

planning of information, education, or persuasion programs to reduce those discrepancies between the customer's and the engineer's perspectives that are deemed necessary may contribute importantly to a smoother implementation of design decisions.

Method for Customer Needs Assessment

We propose a new interviewing method to obtain the requisite customer input regarding both internal quality details and higher-order needs and values. The method combines features of QFD interviews with that of laddering (Gengler and Reynolds 1995, Grunert and Grunert 1995; Reynolds and Guttman 1988), a technique used in means-end analysis in advertising research. To help customers elicit the link between product attributes and values, the technique proceeds in a sequential fashion. It builds chains from important service attributes to consequences, benefits, or experiences associated with an attribute and ultimately to the personal value or values served. In advertising research, however, laddering is not aimed at linking customer needs to their means of accomplishment within an organization. This is, of course, where the advantages of QFD come into play. Interviewing and observation methods typically used in QFD (Hauser and Clausing 1988; Griffin and Hauser 1993; Mazur 1993, 1997) aim at eliciting more specific product and service attribute information than is typically the case in laddering. Our proposed method combines the two approaches.

Because of the intangible, multifaceted, and experiential nature of extended service transactions, articulating these expectations is a difficult task for customers. To facilitate this task, our approach starts with asking respondents to remember, in as much detail as possible, specific past experiences with four different brands of the extended service transaction under study. Once they have in mind a clear and vivid image of each of these brands, respondents are asked to identify similarities and differences between them in a series of triads formed from those brands (following Kelly 1955). Similarities and differences can relate to customer needs for aspects of the services that are expected to be present or for failures that should have been

prevented. The pool of product and service attributes used for comparing brands constitutes the pool of lower-level needs. Note that under the proposed adaptation, these needs may relate directly to any of the deployment matrices presented in Figure 2. Unlike traditional laddering, they are not limited to demanded quality attributes per se.

Typically, product and service attributes that customers spontaneously generate can correspond to any of the primary (e.g., luxurious property), secondary (e.g., luxurious bathroom), or tertiary (e.g., marble and darker wood accents) levels defined in the QFD approach. For instance, a respondent can mention the primary need “empathy," while others may mention the service personnel’s courtesy and their ability to understand, be aware of, and be sensitive to a customer’s feelings, thoughts, or experiences (secondary need). Or, respondents may allude directly to a set of tertiary-level needs that combine to form a secondary need. For instance, scripts of verbal interactions, eye contact, interpersonal distance, or friendly behavior may express customer desires for “courteousness.”

Regardless of the level at which respondents naturally initiate the description of product and service attributes, interviewers strive to elicit, for each attribute, other levels. For instance, if a respondent first expresses the importance of empathy in a service encounter, the interviewer will probe to ascertain how this empathy is manifested. Conversely, if a respondent first mentions direct, positive eye contact as an attribute, the interviewer will ask what the eye contact says about the service employee. Once the attributes are elicited as completely as possible, interviewers summarize this first section of the interview by listing the 10 most salient attributes that emerge.

The interviewer then asks the respondent to provide an importance rating for each attribute on a scale from 1 (not at all important) to 9 (very important) for repeat patronage of the service firm. Ladders are subsequently built to link these attributes with their consequences to the customer and, finally, to link these consequences to personal values. Here again, the level of specificity of the attributes chosen to build the ladder is defined by the customer’s expression. This second section of the interview consists of the repeated administration of different versions of the same probe asking respondents: “Why is this important to you?” In this way, a respondent moves sequentially from listing a product and service attribute to stating the importance of the attribute in producing a

specific consequence, benefit, or experience for them and, ultimately, to revealing the importance of this benefit in the achievement of higher-order ends and human values. Typically, respondents elaborate 4 to 6 distinct ladders (Reynolds and Guttman 1988).

Empirical Demonstration with Luxury Business Hotels

This interviewing method was used to elicit the voice of the customer for luxury business hotels. The objective was to test the ability of the technique to tap into a more comprehensive representation of customer needs as required by the proposed adaptation of QFD for services. The empirical study also provides a test of the assumptions upon which our proposed adaptation of QFD is based.

Sample

Respondents were 92 international frequent business travelers who routinely use luxury hotels (14 United States, 18 Canada, 20 Peoples Republic of China, 11 Hong Kong, 12 India, and 17 Pakistan). Another objective of the empirical study was to examine cross-cultural similarities and differences that may exist in customers' needs for extended service transactions. Our focus here is more on the nature of the customers input to the QFD process, not cross cultural differences. Details of the cross-cultural comparisons are presented in Dube et al. (1998).

Interviews were conducted in the country of the respondents. Respondents were recruited on a convenience basis, either from the clientele of specific luxury hotels or from the list of participants in executive business seminars. A limited number of respondents were recruited from other organizational and social networks. To be eligible for the study, respondents had to stay, on average, 20 nights or more in luxury hotels each year. Luxury hotels were defined as those charging a premium price in their national market. Respondents participated in the study on an individual basis. Each session lasted between 40 to 60 minutes.

Interviewers' guidelines, based on the method presented above, were pretested in the specific context of luxury hotels. As preliminary training, interviewers had to master these guidelines and to subject themselves as respondents to a laddering interview. Except for interviews conducted in the Peoples Republic of China, all interviews were conducted in English. In the PRC, interviews were conducted in Chinese (Cantonese) by a person who was perfectly fluent in English as well. She proceeded to the English translation before codification. The interviews were tape-recorded and, in addition, interviewers took detailed complementary notes during the interview. A North American research assistant performed analysis of all interviews in English.

Content Analysis Results

Protocols of the two parts of the interview (i.e., elicitation of product and service attributes and ladders on the most important attributes) were divided into independent pieces of information. The product and service attribute information was classified according to its level in the QFD deployment framework. Information emerging from the ladders was coded in terms of their direct (consequence, benefit, and experience) and indirect (personal value) links to the product and service attributes. An inventory of different pieces of information within each category was performed to portray customer needs at both lower and higher levels.

Customer needs related to product and service attributes.

As expected, customers expressed a diversity of needs that encompassed all of the QFD deployment categories. A total of 408 product-related customer needs were generated across all categories. Each customer need was assigned to one of the deployment houses illustrated in Figure 2. Finer grained categorizations were made for two deployment houses. In the house of quality, demanded quality elements were subdivided in two categories: Process-driven needs were those demanded quality elements whose fulfillment required sequential translation into service function, process,

and operation requirements (e.g., friendly service). Structure- driven needs were those whose fulfillment was primarily related to the infrastructure and/or structure of the firm, with less need for sequential translation in design and less variability in transaction-to-transaction delivery into function, processes, and operation requirements (e.g., sea-front view from the room). The second deployment for which a finer-grained differentiation of customer needs was made was for the operation requirement deployment. Separate categories were defined for operation procedure and policies, human resources, physical resources/equipment, and physical resources/facilities and layout.

Examples of customer input for each deployment category are provided in Table 1. The most important finding is that the table contains two very different types of information. Some of the attribute information expresses what a customer wants regardless of the means that the service firm might use to deliver it (the Whats in the house of quality), encompassing both process-driven and structure-driven needs. There is, at the same time, a significant proportion of statements that clearly express specific means of accomplishing the customer wants within the organization.

Specifically, a good number of customer needs (79 mentions, 20%) corresponded to process-driven demanded quality elements, most often espoused in the existing comprehensive QFD, i.e.. those quality elements that were ready to be translated in measurable service quality attributes to be eventually designed through the function-process-operation deployment sequences. Structure-driven demanded quality elements were also abundant (60 mentions, 15%).

A limited number of customer needs (17 mentions, 4%) referred directly to specific functions with no mention of processes (e.g., concierge, porter, or airport pick-up as necessary functions), whereas a more important number of needs (74 mentions. 18%) entailed precise specifications of different hotel processes, in particular check-in and checkout. Needs related to operation deployments follow7 for each type of input: human resources management (21 mentions, 5%); operating policies and procedures (29 mentions, 7%); physical resources/facilities and lay-out (26, 6%); and physical resources/material, equipment, and furniture (102, 25%).

Customer needs related to consequences, benefits, experience, and values.

The contents of the second section of the interviews (ladders) were coded as to consequences or benefits derived from hotel attributes or as values derived from the benefit-consequences. For instance, the attribute, “well-equipped sport and fitness center” could be associated with “allows me to keep doing my exercise” as a consequence. This consequence may, in turn, be associated with “keeps me in good health” as a human value. It is noteworthy that the highest level of abstraction reached in a given ladder varied across respondents and attributes. Both direct links (as from fitness center directly to exercising) and indirect links (as from fitness center to good health via exercising) were recorded for each respondent.

TABLE 1

Examples of Customer Needs and Their Position in Relation to the QFD Deployments

House of Quality	Function Deployment	Process Deployment	Production Deployment (Human Res. and Operating Policies)	Production Deployment (Physical Resources)
Demanded quality (process-driven)	Airport pick up	Being offered assistance for luggage with no need to ask	Human resources	Physical resources (facilities)
Variety in types of cuisine	Business center	Greeted with genuine smile, not fake	Staff genuinely interested in me as a person	Rooms larger than 400 sq. feet
Fast room clean up	Fitness center	No waiting line at desk or minimal wait	Staff who likes people	Grand entrance
Efficient check-in	Turndown service	Late checkout possible	Managers with good sense of humor	Starbucks as part of the hotel F&B outlets
Flexible check-in/out	Concierge service	Use technology to make check-in more efficient without losing personal touch	Beautiful staff	Physical resources (equipment)
Friendly service	Valet service	Staff not running around uselessly at check-in	Operating policies and procedures	HVAC with fast responses
Competent service		Staff not sitting idle	Late check-out without having to beg	Queen-size bed minimum
Fast delivery of messages		Chocolate or mint with turndown service	Comprehensive pricing	2 phones with 2 lines
Quick laundry services			24-hour check-in/out	Safe door with double bolt
Demanded quality (structure-driven)			24-hour room service	Cotton linens (230 tpi)
Garden-like atmosphere			Business center open 24 hours	Bathrobe in terry cotton
Building compatible with the environment			Limousine service offer 24-hours	Thick towels
Convenient location			Staff has the authority to fix my problems	Information system such that if you check-in once they know everything about you.
Expensive furniture			Towels washed with no residual chlorine smells	Physical resources (layout and atmosphere)
Majestic view from the bedroom			Beds made when I am away	Vacuum cleaner should not be too loud
			Breakfast served within 15 minutes	Flower arrangement in the middle of the lobby
			35 minutes turnaround time at breakfast	TV above bed
			3-hour laundry services	
			12-hour laundry services	

The results revealed a rich diversity of higher-order needs that customers derive from product and service attributes. The most frequently mentioned consequences were, in decreasing order: being in a good state of mind, saving time, being worry-free, feeling at home, being comfortable, being rested, being relaxed, and having a positive self-image. Except for saving time, all of these consequences are experiential in nature. In spite of their subjective nature, customers were able to establish meaningful links between these consequences and specific product and service attributes. Table 2

TABLE 2

Examples of Higher-Order Customer Needs (Experiential Aspects) and Associated Lower-Level Needs Related to Product and Service Attributes

Worry Free	Good State of Mind	Cared for	At Home	Self-image
Helpfulness and competence of concierge	Quiet, not crowded lobby	Recognized and called by their name upon arrival	Room service on time	Food quality
Knowledgeable and accurate concierge	Good ambiance in bar, restaurant, and lobby	Smile when acknowledge my presence	Well-groomed staff	Food variety
Personal not cold, overzealous, nor too solicitous	Large lobby with great momentum	Fruit basket and greeting card in bedroom	Efficient staff	Good variety of food to entertain guests
Experienced staff	Bright and wide public spaces	Corporate rates and frequent guest program	Know my name.	Good bathroom amenities
Caring staff	Majestic view from the bedroom		Staff interested in me as a person	Look and reputation of other customers
Look of other guests	Wide arrival and departure area outside		Nice and warm attitude of staff	Hairdryer easy to find
Security guard present	Grandness of architecture		Polite attitude of staff	Hairdryer that works well
Well-equipped to work (computer plugs, multiple phone lines, space for work)	New bright facilities		Staff makes me feel trusted	Outrageous phone charges they ask me to accept while not spend money wisely
Equipped and compfortable bathroom	Convenient location		Good working in-room equipment (computer plugs, 2 phone lines)	High prices are important
In-room coffeemakers	Room available at arrival		Comfortable room furniture	Location
Locking patio door	Good reception		Nice health club	Luxury image of the property
Places for intimacy in the lobby	Fast room service		Large bed	Large bedroom
Accessible switches and plugs	Fast check-in		Cozy atmosphere	
Guaranteed reservation never turned away	Greeted with smile		Smoke-free room	
Room always maintained in good working order.	Nice bathroom amenities		Speed of service	
	Well-groomed staff		Staff presence my privacy	
	Good-looking staff		Flexibility in service	
	Personable staff		Cleanliness of things	
	Efficient staff		No outrageous phone charges	
	Employees with genuine smile		Variety of services, including fitness	
	Employees with personal touch		Pool and gym	
			Spacious room	

presents, for selected experiential states, the constellation of product and service attributes that were perceived as possible antecedents.

Lower-level customer needs bearing on all the QFD deployment could be identified as antecedents of each aspect of the customer's experience. Consider the antecedents of being "worry-free." Product and service attributes that can induce a customer to feel worry-free are primarily associated with process and operations deployment (more specifically, human resources and operating procedures and policies). Turning to the personal values, the most frequently mentioned were, in decreasing order: doing good business, having good value for money, sense of accomplishment, and pleasure. Different attribute-consequence routes could in turn achieve each of these values. For instance, a positioning on the value of accomplishment could be achieved via alternative intermediary consequences such as being rested, worry-free, in a good mood, or saving time, each of which in turn corresponded to a different constellation of product and service attributes.

Discussion

The results of the study demonstrate the usefulness of the proposed interviewing procedure in providing a comprehensive assessment of customer needs for extended service transactions and support the assumptions upon which our proposed adaptation of QFD is based. First, our sample of customers provided clear links from product and service attributes to higher-level customer needs (consequences, benefits, experiences, and personal values). An improved understanding of higher order needs and of the product and service attributes deemed necessary to their achievement is critical toward determining the relative importance of particular attributes, as via satisfaction modeling, for use as input to the house of quality for each target market segment. It will also help management to estimate the operational demands that a particular segment will place on their service organization and facilities.

Second, our customers provided significant input regarding the means by which service organizations produce and deliver product and service attributes. Our discussion suggests two ways that this more detailed customer input may be used without compromising the priority setting process that links the various QFD houses. One is to use this customer input (regarding service activities or functions, process designs, operating policies, tasks, and procedures) to supplement development of the Hows in the various deployment houses. The other is to use this information to help understand the relationships among the Whats and Hows in the various matrices. By tapping into a greater storehouse of knowledge in the customer population, these changes should leverage the success and application of QFD to services. The proposed adaptations should help applications of QFD to reduce uncertainty and improve congruence between service design and delivery. Our results clearly demonstrate that customers have precise points of view regarding how certain service processes should unfold, who should do what, and under what conditions.

In showing that customer needs and knowledge regarding extended service transactions bear directly on all deployment matrices, our study underscores the complexity and the magnitude of the challenges involved in service design and delivery. However, the core of successful service design and management consists precisely in establishing and maintaining a profitable link between, on the one hand, the fulfillment of those multifaceted customer needs that are most critical to satisfaction and repeat

patronage and, on the other hand, the physical facilities, employees, and processes of the firm. If those involved in service design and management are to succeed, they must appreciate the breath and intricacies of customer needs to be able to translate them into concrete thoughts, decisions, and actions in the process of designing and delivering service quality.

We hope that the proposed adaptation of QFD provides a template for future research and applications of QFD in a service context. As recognized by QFD experts (Hauser and Clausing 1988), knowledge creation is a social process. In a service setting and particularly an extended service transaction, customers are an integral part of the service production process. It would be a mistake to unnecessarily limit their role in the quality assurance and improvement process.

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